

The Timing of Preventive Services for Women and Children: The Effect of Having a Usual Source of Care

ABSTRACT

Objectives. This study investigated the causal effect of having a usual source of medical care on the timing of preventive services by women and children.

Methods. Data on 17 110 children and 23 488 women from the 1988 and 1990 National Health Interview Surveys were used to estimate ordered probit models of the effect of having a usual source of medical care on the time since the last receipt of each preventive service (routine checkups for children; blood pressure checks, Pap smears, and breast exams for adult women; mammograms for older women). Two-stage instrumental variables methods were used to eliminate simultaneity bias.

Results. The existence of a usual source of medical care was strongly correlated with the earlier receipt of preventive services, and the relationship appears to be causal for Pap smears, breast exams, and mammograms. However, there was little evidence that having a regular provider caused an increased rate of routine checkups for children or blood pressure checks for adult women.

Conclusions. Delivery systems that encourage the development of long-term relationships with medical providers may increase cancer screening rates among women. (*Am J Public Health.* 1996;86:1748-1754)

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Introduction

Continuity is thought to be an integral component of quality of care.¹⁻⁴ Researchers and policymakers often assume that a patient's usual source of medical care has a large influence on utilization patterns and outcomes. Despite the prevalence of this view, there has been little empirical research on this question. An early review of the evidence on whether long-term provider relationships affected the quality of care concluded that much of the research suffered from methodological problems and that no studies had adequately addressed preventive services.⁵

More recent studies examined the relationship between the usual source of care and service utilization, but in each case, only limited inferences can be drawn.⁶⁻¹² Two studies compared patients with different usual sources of care, but did not study the effect of having no regular provider.^{6,7} The other studies suggested that patients with no regular provider are also those who experience delays in medical treatment and preventive services.⁸⁻¹² However, these results do not necessarily imply that the lack of a regular provider caused the treatment delays. Persons who pay frequent visits to physicians or regularly use preventive services have a greater incentive to seek out a usual source of care. In a review of this literature, Starfield argued that individuals who use more medical services are more likely to report that the provider is a usual source of care.¹ Thus, it may be misleading to interpret the association of having a regular medical provider with choices about medical treatment as a causal effect, rather than simply a correlation.

The purpose of this study is to estimate the effect of having a regular

provider on the timing of preventive services. Ordinary regression methods are insufficient because they do not account for potential reverse causality in the relationship. However, an econometric technique, known as instrumental variables, has been developed to address this statistical issue.^{13,14} This method is widely used in social science literature and has recently been introduced to studies of medical outcomes.¹⁵

Instrumental variables methods can be thought of as a quasi-randomization procedure applied to nonexperimental data. The procedure relies on the existence of a variable, known as the "identifying instrument," that effectively randomizes patients to treatment and control groups. In this study, potential instruments are variables that directly affect whether the patient has a usual source of care, but only indirectly affect the timing of preventive services through the existence of the regular provider. For example, persons who have lived in the same area for a longer period of time are more likely to have established ties to health professionals. At the same time, there is no strong reason to think that the length of residence affects the timing of services after the existence of a regular provider has been controlled for. Thus, the observation that persons who have been living in the same place for a longer time receive more frequent preventive services can be interpreted as evidence that having a regular provider improves access to pre-

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ventive services (given certain assumptions and with other patient characteristics controlled for).

This logic is similar to the argument used in a study of the effect of Vietnam service on subsequent mortality.¹⁶ Draft lottery number was used as the "instrument," and any excess mortality among men with low numbers was attributed to their higher probability of military service. Although the statistical procedures used here are more complicated because other confounding factors are controlled, the intuition is the same.

Methods

Patients

The data are from the 1988 and 1990 National Health Interview Surveys (NHIS) conducted by the National Center for Health Statistics. The sample universe is the civilian, noninstitutionalized US population. Blacks were oversampled. Data from the 1988 child-health supplement and core survey were merged with 1988 American Medical Association data from the Area Resources File on the number of physicians per 100 state residents. Data from the 1990 health promotion and disease prevention supplement, family resources supplement, and core survey were merged with 1990 physician supply data.

The two populations studied were children under 18 from the 1988 survey ($n = 17\,110$) and women 18 and older from the 1990 survey (23 488). For the analysis of mammograms, the sample was restricted to women 50 and older. The sample sizes differ slightly across regressions, owing to item nonresponse. Because nonresponse does not exceed 4% for any outcome, selection bias is unlikely to be great.

Analytic Approach

Describing the population. Means and standard deviations were first calculated for all variables. The preventive services examined were routine medical visits for children; blood pressure checks, Pap smears, and breast exams for adult women; and mammograms for women 50 and older. The time since the last receipt of each service was derived from questions in the format "When did you have your last mammogram?" The outcome variable was set equal to 4 if the service was received within the previous year, 3 if received 1 to 2 years ago, 2 if received 3 to 5 years ago, and 1 if received more than 5

years ago or never received. Because professional groups do not always achieve consensus on the appropriate timing of these services, no attempt is made to define whether the service was received within a "recommended" time period. The results therefore reflect recency, rather than appropriateness.

The analysis focuses on the existence of *any* usual source of care because both earlier research⁹ and preliminary analyses provided little evidence to suggest that the *type* of provider made a large difference in the use of preventive services. People were defined as having a usual source of medical care if they answered "yes" to the question, "Is there a particular clinic, health center, doctor's office, or other place that you usually go to if you are sick or need advice about your health?" If some patients who do not currently have a usual source of medical care had one in the recent past, then the impact of currently having one is likely to be biased toward zero.

Association between usual source of care and preventive services. Ordered probit models were first estimated in the usual manner, and statistical significance was determined using a 5% cutoff for type I error. The time since each service was last received was specified to be a function of whether the patient has a usual source of medical care, with other factors that were hypothesized to influence utilization controlled for. The ordinary estimates establish whether the existence of a regular provider is correlated with the outcomes after confounding factors are controlled for, and these estimates provide a basis of comparison for the instrumental variables estimates. Regressions were unweighted because after race was controlled for, use of the sample weights did not affect the results significantly and unweighted estimates are more efficient.

Predicted relative risks were calculated for each patient and averaged across the sample. These represent the patient's probability of having last received the service within each given time period if she has a usual source of medical care, divided by the probability if she does not. A value greater (less) than 1 implies that persons with a usual source of medical care have a higher (lower) probability of the outcome than persons without a regular provider; a value close to 1 implies that having a regular provider has little impact on service use.

Other explanatory variables. For women, the other explanatory variables included age, race, ethnicity, insurance

coverage, education, metropolitan residence, Census region, marital and employment status, family size and income, self-assessed health status, and the number of physicians per capita. The empirical specification differed slightly for children because the survey questions were not identical and because the relevant characteristics are primarily those of the child's parents. For children with a missing parent, the values of parental characteristics were set equal to zero and an indicator for missing parent was set equal to 1. The means of parental education and age are calculated using the subset of children who live with the parent.

Determining causality with the use of instrumental variables estimation. Because statistical tests¹⁷ indicated that the usual source of care is determined simultaneously with the timing of preventive services, the model was reestimated with the two-stage instrumental variables techniques of Dubin and McFadden.¹⁸ The intuitive description of instrumental variables methods was discussed in the introduction; the two-stage procedure was carried out by replacing the actual indicator for having a usual source of care with its predicted probability from a first-stage regression that includes all of the predetermined variables (i.e., all variables hypothesized to influence the timing of preventive services plus length of residence). Details of the exact methods used and alternative procedures considered^{19,20} can be found in a technical appendix available on request.

Instrumental variables will yield consistent estimates of the causal impact of usual source of medical care on the timing of preventive services under the following assumptions^{21,22}:

1. **Nonzero average causal effect.** With the other covariates controlled for, length of residence is a good predictor of whether the respondent has a usual source of care.

2. **Monotonicity.** All respondents who would have a usual source of medical care if they lived in an area for a short time would also have one if they lived in the area for a long time.

3. **Exclusion restriction.** Length of residence does not explain the receipt of preventive services after the existence of a usual source of care and the other covariates are controlled for.

4. **Stable unit treatment value assumption.** The receipt of preventive services by one respondent is not affected by whether other respondents have a usual source of

TABLE 1—Descriptive Statistics for Children and Women from the 1988 and 1990 NHIS

	Children (n = 17 110)	Adult Women (n = 23 488)
Any usual source of care, %		
Yes	89	84
No	11	16
Sex, %		
Female	49	100
Male	51	0
Race, %		
White	78	82
Black	17	15
Other	5	3
Ethnicity, %		
Non-Hispanic	90	93
Hispanic	10	7
Health insurance, %		
Medicaid	12	9
Private insurance	74	75
Medicare	...	22
CHAMPUS	...	3
No insurance	17	12
Metropolitan residence, %		
Metropolitan	75	75
Nonmetropolitan	25	25
Geographical area, %		
Midwest	26	26
South	35	35
West	20	19
Northeast	19	20
Marital status, %		
Married	...	46
Divorced or separated	...	17
Widowed	...	11
Never married
Self-assessed health, %		
Excellent	53	31
Very good	26	29
Good	17	26
Fair	2	10
Poor	> 1	4
Don't know	> 1	> 1
Employment, %		
Employed	...	55
Not employed	...	45
Maternal employment, %		
Mother employed	61	...
Mother unemployed	37	...
No mother in household	2	...
Paternal employment, %		
Father employed	73	...
Father unemployed	5	...
No father in household	22	...
Age, y, mean (SD)	8.36 (5.46)	46.11 (18.83)
Education, y, mean (SD)	...	12.39 (2.95)
Family size, no., mean (SD)	...	2.50 (1.45)
Family income, \$, mean (SD)	25 400 (16 900)	21 800 (17 500)
Mother's age, y, mean (SD)	34.95 (8.61)	...
Mother's education, y, mean (SD)	12.57 (2.62)	...
Father's age, y, mean (SD)	37.94 (9.03)	...
Father's education, y, mean (SD)	12.99 (2.95)	...
No. siblings, mean (SD)	0.98 (1.01)	...
Physicians per 100 persons in state, mean (SD)	0.20 (0.05)	0.21 (0.05)

Note. Percentages are reported for categorical variables and means and standard deviations for continuous variables. Percentages do not always add to 100 because of rounding or because categories are not mutually exclusive. CHAMPUS = Civilian Health and Medical Program of Uniformed Services; NHIS = National Health Interview Survey.
Source. For children, the 1988 NHIS; for women, the 1990 NHIS.

medical care, and there are only minor differences in effectiveness among usual source of care types.

5. Random assignment. Respondents are effectively randomized into how long they have lived in an area, at least within subgroups defined by the covariates.

The first assumption is testable and was examined by testing the significance of length of residence in the first-stage equation for the usual source of care. The second assumption seems reasonable. The third assumption would have been less plausible if the outcome were health status. In that case, it could have been argued that people who move frequently are more stressed or have built up less immunity to the viruses in the local area, an implication that length of residence has a direct effect on health. However, it is difficult to think of circumstances in which the exclusion restriction might fail when the outcome is the receipt of preventive services, especially because self-assessed health is included as a separate covariate in the model.

The fourth and fifth assumptions require greater justification. It is possible that some sources of usual care, such as office-based physicians, are more effective than others at improving the use of preventive services. However, the earlier discussion of this issue indicates that differentials are unlikely to be large. Likewise, examples of potential nonrandom assignment are possible, but such cases are likely to be infrequent. Effective randomization implies that knowing what each person's outcome would be for each possible length of residence in an area does not yield any information about the person's actual length of residence. A counterexample might be if parents who are high-strung tend both to move often and to take their children for more frequent checkups. To the extent that other covariates in the model do not fully capture such parental traits, the quasi-randomization assumption fails: the knowledge that parents would take their children in for frequent checkups, regardless of how long they had lived in the area, would enable us also to predict that the parents change their place of residence frequently. (An alternative to instrumental variables estimation would be to include length of residence as an additional covariate in the ordinary probit regression, rather than use it as an instrument. However, this strategy would require a stronger assumption than the instrumental variables model for the

effect of having a usual source of care to be interpreted as causal. Instead of assuming that the assignment of length of residence is ignorable, i.e., that it is randomly assigned within patient subclasses defined by the other regressors, one has to assume that the assignment of usual source of care is random within subclasses defined by the other regressors plus length of residence. Ordinary estimation of the time since the last receipt of preventive services yielded almost identical parameter estimates when length of residence was and was not included as a covariate.)

Results

Description of the Sample

As Table 1 shows, 17% of the NHIS children and 12% of the NHIS women had no health insurance coverage. The samples look nationally representative in terms of demographics, except for the oversampling of Blacks. Table 2 shows that receipt of services during the previous year ranged from approximately 65% to 80% of patients, depending on the type of service. About 2% to 15% of the patients received the service longer than 5 years ago or never. These data do not, however, indicate how having a usual source of care affects this distribution.

Association between Usual Source of Care and Preventive Services

The ordinary estimates, shown in Table 3, indicate a strong association between the existence of a usual source of care and earlier receipt of preventive services, with the other covariates controlled for. Patients who had a regular provider also had a higher probability of having received services during the previous year (relative risks greater than 1) and a lower probability that the latest services received occurred during less recent time periods (relative risks less than 1). This pattern held for each service, and the ordinary estimate was statistically significant in each case.

For example, children with a usual source of care were also more than twice as likely as those without one to have had a routine checkup during the previous year. Women with a usual source of medical care were almost one and one half times as likely to have received each service within the previous year. These data control for a variety of confounding factors and show that having a regular provider is correlated with the timing of

TABLE 2—Descriptive Statistics on the Time the Respondent's Preventive Service Was Last Received

Type of Service (Sample)	Time of Last Receipt of Service, % of Sample			
	< 1 Year Ago	1–2 Years Ago	3–5 Years Ago	> 5 Years or Never
Routine checkup for children < 18 y (n = 16 526)	66	18	11	5
Pap smear for women ≥ 18 y (n = 22 648)	66	11	9	14
Breast examination for women ≥ 18 y (n = 22 824)	70	11	8	11
Mammogram for women > 50 y (n = 5 008)	67	17	11	5
Blood pressure check for women ≥ 18 y (n = 22 943)	81	11	6	2

Source. For children, the 1988 NHIS; for women, the 1990 NHIS.

TABLE 3—Ordinary Estimates of the Effect of Having a Usual Source of Medical Care on the Time Since Respondent's Last Receipt of Preventive Services

Type of Service	Time That Service Was Last Received, Relative Risk ^a			
	< 1 Year	1–2 Years	3–5 Years	> 5 Years or Never
Checkups for children < 18 y (n = 16 526)	2.09	0.69	0.35	0.15
Pap smears for women ≥ 18 y (n = 22 648)	1.48	0.82	0.66	0.42
Breast exams for women ≥ 18 y (n = 22 824)	1.47	0.74	0.59	0.38
Mammograms for women > 50 y (n = 5 008)	1.47	0.77	0.56	0.35
Blood pressure checks for women ≥ 18 y (n = 22 943)	1.38	0.51	0.33	0.18

Source. For children, the 1988 NHIS; for women, the 1990 NHIS.

^aThe relative risk is the probability the patient last had the service during the specified time period if the patient has a usual source of care, divided by the probability if the patient does not have a usual source of care. Relative risk = 1 implies no effect of usual source of care on the timing of preventive services. The specification is an ordered probit model, and all regressions control for demographics, insurance coverage, family characteristics, self-assessed health, and physician supply.

* $P \leq .05$ for all types of service for the overall effect of usual source of care on the timing of the service.

preventive services. However, because statistical tests indicated the presence of simultaneity, these estimates do not establish causality.

Effects of Other Explanatory Variables

In results not shown in the tables, both income and insurance status were significant determinants of preventive services among both women and children. Increasing income by one standard devia-

tion was associated with relative risks of having had services during the previous year that ranged from 1.02 to 1.06.

Children with either Medicaid or private insurance were more likely to have recently received checkups. The respective relative risks of having had a routine checkup during the previous year were 1.13 and 1.04. Insured women were significantly more likely to have recently received each type of service, although in

TABLE 4—Number of Years the Respondent Has Lived in the Current Area of Residence, by the Existence of a Usual Source of Medical Care

	Without a Usual Source of Care	With a Usual Source of Care
NHIS children		
Years at current address, mean (SD)	3.75 (4.79)	4.70 (4.72)
NHIS women, %		
Length of residence in state*		
Not born in the US	17	10
< 1 y	4	10
1–5 y	6	4
5–10 y	4	3
10–15 y	4	3
> 15 y	65	78
Length of residence in US*		
< 1 y	1	1
1–5 y	3	1
5–10 y	2	1
10–15 y	2	1
> 15 y or born in US	91	97

Note. n = 17 110 children and 23 488 adult women. Columns may not add to 100% because of rounding.

*Length of residence was statistically significant at $P < .01$ in probit regressions of the probability of having a usual source of care, with demographics, insurance coverage, family characteristics, self-assessed health and physician supply controlled for.

Source. For children, the 1988 NHIS; for women, the 1990 NHIS.

dren experienced more recent care, as did children living in the Northeast, metropolitan areas, and areas with more physicians per capita. Children whose health was rated as poorer or who had better educated mothers, fewer siblings, or unemployed fathers were also more likely to have had a recent checkup.

Results for the women differed somewhat by the type of service, especially for mammograms, for which statistical power is lower. Generally, however, women who were older, never married, poorly educated, or rural residents or who had larger families were less likely to have received services during the previous year and more likely to have received them more than 5 years ago or never. With income, insurance, and usual source of care controlled for, blacks were significantly more likely to have received services recently. No clear-cut patterns emerged with respect to the effects of geographical region and physician supply on services.

Determining Causality Using Instrumental Variables Estimation

Because the estimated impact of the other regressors changed little when instrumental variables regression was used, the following discussion focuses on the effect of usual source of care. Most women and children had a usual source of medical care, with the rate slightly higher among children (89% vs 84%; see Table 1). As Table 4 shows, both women and children who had lived in the same area for longer periods of time were more likely to have a usual source of medical care. This effect was highly significant in (unreported) probit regressions of the probability the respondent has a usual source of care, confirming the instrumental variables assumption that length of residence has a nonzero average causal effect.

The instrumental variables estimates in Table 5 show that despite the association between the two variables, having a usual source of medical care did not improve the timing of routine checkups for children. The estimated causal effect was actually negative, although statistically insignificant. Similarly, the impact of having a usual source of care on the time since the last blood pressure check for adult women was smaller than suggested by the ordinary estimates and was only marginally significant ($.05 < P < .10$). On the other hand, having a regular provider did improve the timing of Pap smears, breast exams, and mammograms for women. For these services, accounting for

TABLE 5—Instrumental Variables Estimates of the Effect of Having a Usual Source of Medical Care on the Time Since Respondents' Last Receipt of Preventive Services

Type of Service	Time That Service Was Last Received, Relative Risk ^a			
	< 1 Year	1–2 Years	3–5 Years	> 5 Years or Never
Checkups for children < 18 y (n = 16 526)	0.93	1.16	1.28	1.45
Pap smears for women ≥ 18 y* (n = 22 648)	4.49	1.18	0.66	0.16
Breast exams for women ≥ 18 y* (n = 22 824)	2.28	0.74	0.49	0.21
Mammograms for women > 50 y* (n = 5 008)	3.15	0.85	0.40	0.13
Blood pressure checks for women ≥ 18 y (n = 22 943)	1.15	0.69	0.56	0.42

^aThe relative risk is the probability the patient last had the service during the specified time period if the patient has a usual source of care, divided by the probability if the patient does not have a usual source of care. Relative risk = 1 implies no effect of usual source of care on the timing of preventive services. The specification is an ordered probit model, and all regressions control for demographics, insurance coverage, family characteristics, self-assessed health, and physician supply.

* $P \leq .05$ for the overall effect of usual source of care on the timing of the service.

Source. For children, the 1988 NHIS; for women, the 1990 NHIS.

the case of mammograms, only the effect of private insurance was significant. Differences by type of insurance were modest for all outcomes.

In the range considered here, age decreased the probability of having had a recent checkup. After other factors were controlled for, Black and Hispanic chil-

potential reverse causality actually increased the magnitude of the estimates, and they remained highly significant. For example, the instrumental variables estimates suggest that women who have a usual source of medical care are over 4 times as likely to have had a Pap smear, twice as likely to have had a breast examination, and 3 times as likely to have had a mammogram during the past year as women who do not have one.

Discussion

The increasing focus on disease prevention and health promotion highlights the need to identify factors associated with the use of preventive services. For example, enrollment in health maintenance organizations rose from 33.7 million in 1988 to 49 million in 1994.²³ Health maintenance organizations have been shown to increase the use of cancer screening exams.⁶ Although such effects are often attributed to enhanced coverage of preventive services by health maintenance organizations, an alternative explanation is that "gatekeeper" systems encourage the formation of long-term relationships with a single provider, which in turn improve access to preventive services. If this hypothesis is correct, then potential disadvantages of managed care systems due to their financial incentives to contain costs should be weighed against the potential benefits of having a regular provider.

The need to increase access to preventive services is great. Although there is disagreement among providers on how often these services are needed, it is striking that in this study, approximately one fifth of women did not receive cancer screening exams during the preceding 2-year period and almost the same proportion of children did not receive a routine checkup. About half of these women and children had received the service more than 5 years ago or never. These numbers indicate only a slight increase in service delivery since the late 1970s.²⁴ Much room for improvement still exists.

This study expands upon research showing a correlation between the existence of a regular provider and earlier receipt of preventive services^{6,8-12,25} by using instrumental variables methods to determine causality. Several conclusions emerged. Among children, there is no evidence that having a usual source of medical care increases the recency of checkups. The association apparently arises because lasting relationships with a

pediatric provider are often formed when parents frequently take their children for checkups and other care.

Among women, having a regular provider greatly increases the frequency of breast examinations, Pap smears, and mammograms. For example, the estimates predict that, on average, among women over 50 in the sample, developing a relationship with a medical provider would increase the patient's future probability of having a mammogram during the previous year from 23% to 69%. However, there is only weak evidence that having a regular provider increases the recency of blood pressure checks.

This analysis suggests that having a usual source of medical care will increase the use of some, but not all, preventive services. One possible explanation for this pattern of results could be that patients are better informed about the benefits of general medical services (checkups for children and blood pressure checks for adults) than gynecological cancer screening exams (breast examinations, Pap smears, and mammograms). In that case, the provider might play a more important role in patient education. Thus, it is important to distinguish which services are potentially affected by continuity of care.

These conclusions are consistent with RAND Health Insurance Experiment results showing that membership in a health maintenance organization increased the use of preventive services in the general population, but did not significantly affect use among children.^{7,26} By implication, the increase in preventive services must have occurred solely among the adult population, as it does here. Insurance effects were controlled in that study, so one explanation for the improved delivery of preventive services among adult HMO members is a higher probability of having a usual source of medical care. Although this conjecture is contradicted by research concluding that health maintenance organization patients in Los Angeles County had a lower probability of identifying themselves as having a regular provider than fee-for-service patients, that comparison was not adequately adjusted for population differences.²⁷

The current study also provides evidence that higher income and insurance coverage independently improve the timing of preventive services for both women and children, although the effects are modest in size and may be due in part to self-selection of high utilizers into insur-

ance coverage. Earlier results on whether insurance improves the timing of checkups for children were mixed^{10,28} (also J. Mullahy, unpublished data, July 1994), and another study suggested that income has a negligible effect on the use of adult preventive services after the subject's having a regular provider is controlled for.²⁹ The larger effect of Medicaid than private insurance on children's checkups found in this study is consistent with earlier research using the same data and probably reflects the more extensive coverage of preventive services through Medicaid's early periodic screening, diagnosis, and treatment (EPSDT) program.²⁸

Further research on how the existence of a regular provider affects long-term health outcomes would be a useful addition to the literature. However, the evidence presented here on the simultaneity of the decisions to seek a usual source of care and to utilize services should serve a cautionary purpose. Analyses may yield misleading results unless they take into account the possibility that patients who are high utilizers of medical services have a greater incentive to find a regular provider. Future work in this area therefore needs to take this methodological concern into account. □

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